

# THE SEASONAL VARIATIONS IN BIOCHEMICAL COMPOSITIONS OF FRESH WATER MUSSELS *lamellidens corrianus* FROM NANDED REGION, MAHARASHTRA

A. V. SURYAWANSHI<sup>1</sup> & A. N. KULKARNI<sup>2</sup>

<sup>1</sup>Research Scholar, Department of Fishery Science, N. E. S. Science College, Nanded, Maharashtra, India

<sup>2</sup>Head, Department of Fishery Science, N. E. S. Science College, Nanded, Maharashtra, India

## ABSTRACT

*In Lamellidens corrianus, showed maximum protein content was from hepatopancreas  $388 \pm 0.0444$  mg/gm in summer season and minimum  $17 \pm 0.0109$  from foot in winter season. Glycogen content was more during the summer season in all tissues. Maximum glycogen ( $306.28 \pm 0.4206$ ) was found from hepatopancreas in May and the minimum in gills from  $24.32 \pm 0.0055$  in December. The lipid content was maximum from foot is  $14.4 \pm 0.8944$  whereas the minimum from mantle is  $5.4 \pm 0.5477$  in May.*

**KEY WORDS:** *Lamellidens Corrianus, Protein, Glycogen & Lipid*

**Received:** Dec 30, 2018; **Accepted:** Jan 11, 2019; **Published:** Jan 28, 2019; **Paper Id.:** IJAPBCRJUN20191

## INTRODUCTION

Freshwater bivalves provide significant ecological benefits and important source of food for human beings and domestic animals from all over the world (Malathi and Thippeswamy, 2013) and also for the production of freshwater pearls (Dan and Ruobo, 2002; Janakiram, 2008). Mussels contain approximately 20 percent to 28 percent calories from fat and also provide high quality protein with all the dietary essential amino acids for maintenance and growth of the human body (Ersoy and Sereflisan, 2010). These are also considered as replacement of fish meal (Baby *et al.*, 2010; Sicuro *et al.*, 2010). The freshwater bivalves are also a good source of minerals (Ravera *et al.*, 2003; Wagner and Boman, 2004). Seasonal changes in the biochemical composition in the molluscs have been mainly studied to assess the nutritive status and also supplement the information. Proteins are important organic substance and used in tissue building and repairing. They are all essential in cell structure and cell function. Changes in protein content are due to size, growth, reproductive status and availability of food. Seasonal changes in protein content are having importance in energy metabolism which is necessary for growth and reproduction. Biochemical changes in freshwater *Lamellidens corrianus* are mainly affected by external environmental factors. During study period *Lamellidens corrianus* shows maximum protein content in summer and minimum in winter. It maybe due to availability of maximum quantity of food in summer. Mussels are plankton feeder and plankton production is more in summer. Carbohydrates are the primary source of various metabolic processes. Carbohydrates in the tissues of aquatic animals are existing in the form of glycogen. It is well-known that the glycogen serves as an energy reserve for various metabolic processes. Changes in glycogen content are due to temperature, size, growth, reproductive status and availability of food. Accumulations of glycogen take place during their growing season and use them during the rest of life. Lipid is a very important dietary constituent. It

serves as an energy source when food supply is low. Changes in lipid contents are due to temperature, size, growth, reproductive status and availability of food. Decline in Lipid content was observed during breeding season.

## MATERIAL AND METHODS

Biochemical constituents such as protein, glycogen and lipid were estimated monthly from *Lamellidens corrianus*. for biochemical analysis, bivalves were dissected and soft body tissue like mantle, hepatopancreas, gills and foot were removed and stored in deep freezer at 0°C temperature.

### Estimation of Protein

Protein was estimated by using the **Lowry method**(Lowry *et al.*, 1951). Standard solution of protein albumin (10 mg/ml) was prepared freshly. From this solution different dilutions were made ranging from 1 mg/ ml to 10 mg/ ml in distilled water to prepare a standard graph. Estimation was done by taking measurement on O.D. at 540 mu. Amount of protein calculated by using a formula-

$$\text{Amount of the protein} = \frac{\text{Amount of protein obtained from the standard graph} \times 100}{\text{Weight of tissue in grams}}$$

$$= \text{mg of protein per 100 mg of tissue.}$$

### Estimation of Glycogen

Glycogen is estimated by using the anthrone reagent method (De-Zwaan and Zandee (1972). Standard graph was used to estimate glycogen from unknown sample. Amount of glycogen is calculated by using a formula.

$$\text{mg of glycogen} / 100 \text{ mg} = \frac{100 \times U \times S \text{ mg}}{1.1}$$

Whereas,

U = Optical density of unknown sample.

S = Optical density of unknown glycogen concentration,

1.11 = factors for conversion of glucose to glycogen.

### Estimation of Lipid

Lipid content was estimated by using Menthol- Chloroform method by (Bligh and Dyer, 1959). In this method one gram of tissue was taken in a mortar and pestle with anhydrous sodium sulphate, and few ml of chloroform methanol mixture was added in it. After stirring mixture is filtered into another test tube. Then few drops of 0.05N KCL solution are added in the filtrate. This removes non-lipid content and releases the bound acidic lipids. Two phases are developed - upper and lower. Lower phase is transferred into another container and allowed to dry. The amount of lipid present in the samples is determined by using following formula.

$$\text{Amount of Lipid} = \frac{\text{Weight of lipid (g)} \times 100 \text{ mg}}{\text{Weight of tissue (g)}}$$

**Table 1: Shows Month Wise Changes in Total Protein Content from Foot, Mantel, Gill and Hepatopancreas in *Lamellidens corrianus* from Jan 2013 to Dec 2013 and are Expressed as Mg/gm Weight of Wet Tissue**

Tissue Month	Foot Mg/Gm	Mantel Mg/Gm	Gill Mg/Gm	Hepatopancreas Mg/Gm
Jan	23± 0.0230	23± 0.0122	29± 0.0181	29± 0.0122
Feb	23± 0.0054	26± 0.0089	35± 0.1913	42± 0.0054
Mar	281± 0.0472	289± 0.0161	297± 0.0248	304± 0.2930
Apr	283± 0.0683	290± 0.0122	292± 0.0389	305± 0.0254
May	289± 0.0193	289± 0.0432	303± 0.0055	388± 0.0444
Jun	126± 0.0012	181± 0.0079	202± 0.0148	207± 0.0430
July	112± 0.0270	143± 0.0052	162± 0.0029	181± 0.0045
Aug	76± 0.1390	107± 0.1351	138± 0.0722	140± 0.1279
Sep	75± 0.1848	104± 0.5061	109± 0.1804	131± 0.2449
Oct	23± 0.0386	32± 0.0456	42± 0.0054	54± 0.2010
Nov	20± 0.0104	31.8± 0.0753	40± 0.0130	48± 0.0130
Dec	17± 0.0109	29± 0.0044	28± 0.0151	29± 0.0083

**Table 2: Shows Month Wise Changes in Glycogen Content in *Lamellidens corrianus* from Jan 2013 to Dec 2013 are Expressed as Mg/gm Weight Wet Tissue**

Tissue → Month ↓	Foot	Mantel	Gill	Hepatopancreas
Jan	32.39± 0.0046	36.86± 0.0005	34.59± 0.0008	38.02± 0.0016
Feb	35.13± 0.0089	52.66± 0.0343	37.42± 0.0207	68.10± 0.0279
Mar	38.59± 0.0083	100.16± 0.0328	51.29± 0.0089	123.18± 0.0130
Apr	54.05± 0.1985	92.70± 0.2524	69.68± 0.4894	103.83± 0.4953
May	103.29± 0.1577	285.11± 0.1751	182.66± 0.1592	306.28± 0.4206
Jun	47.29± 0.0051	51.29± 0.0027	48.61± 0.0044	53.33± 0.0029
July	33.48± 0.0008	39.20± 0.0008	34.59± 0.0216	40.40± 0.0031
Aug	32.39± 0.0572	38.02± 0.0014	34.59± 0.0014	40.40± 0.0007
Sep	31.32± 0.0023	35.72± 0.0193	33.48± 0.0019	38.02± 0.0008
Oct	31.32± 0.0116	34.59± 0.0042	32.39± 0.0071	36.86± 0.0099
Nov	30.27± 0.0037	32.39± 0.0015	32.39± 0.0013	36.86± 0.0015
Dec	25.27± 0.001	32.39± 0.0158	24.32± 0.0055	36.86± 0.0007

**Table 3: Shows Month Wise Changes in Lipid Content in *Lamellidens corrianus* from Jan 2013 to Dec 2013**

Tissue → Month ↓	Foot Mg/Gm	Mantel Mg/Gm	Gill Mg/Gm	Hepatopancreas Mg/Gm
Jan	1 ± 0.8944	3± 0.2236	2± 0.4472	2.2 ± 0.4472
Feb	1.15± 1.3476	3± 0.4472	2.4± 0.9324	2.57± 0.6280
Mar	13.3± 0.04472	5± 0.7071	3.26 ± 0.1140	3.4± 0.2963
Apr	13.08± 2.0265	5.4± 0.5477	3.4± 0.5477	4.5± 0.6985
May	14.4± 0.8944	5.4± 0.5477	4.2± 0.4472	7.87± 0.1528
Jun	12.62± 0.9311	5.4± 0.5477	4.24 ± 0.1673	3.24 ± 0.16733
July	11.66± 0.01788	5.02± 0.0447	4.3 ± 0.1028	2.8 ± 0.4472
Aug	6.44 ± 3.1033	3.84± 0.4202	3.23± 1.1303	2.6 ± 0.5477
Sep	4.09± 1.6261	3.4± 0.5477	1.58 ± 0.8303	2.6± 0.5477
Oct	3.08± 0.0075	2.6± 0.5477	1.40± 0.0147	1 ± 0.7071
Nov	2.4± 0.5477	2± 1.3038	4.2± 0.8366	0.92 ± 1.0463
Dec	1.6± 0.5477	1.82± 0.0075	1.8± 0.4472	0.70± 0.0040

## RESULTS & DISCUSSIONS

Mussels are economically important animals. They are consumed as a food and for production of pearl and ornamental products. They provide an inexpensive source of protein with high biological value, essential minerals and vitamins. Proteins and glycogen contents are necessary for growth and reproduction. Seasonal fluctuations in biochemical composition are occurred due to changes in environmental condition. Seasonal changes in total protein content, glycogen and lipid content in the foot, mantel, gill and hepatopancreas of *Lamellidens corrianus* are studied from Jan 2013 to Dec 2013 and given in table 1, 2, and 3 respectively. *Lamellidens corrianus* shows maximum protein content in summer and minimum in winter. Maximum protein content was found in hepatopancreas  $388 \pm 0.0444$  mg/gm in summer and minimum  $17 \pm 0.0109$  in foot in winter. Seasonal changes in Glycogen content from *Lamellidens corrianus* more during summer season in all tissues. It was increased gradually from March to May and from July onwards it was decreased gradually and reached to lowest level in winter. It was again gradually increased. *Lamellidens corrianus* showed maximum glycogen in hepatopancreas and in the mantel. In *Lamellidens corrianus* maximum glycogen ( $306.28 \pm 0.4206$ ) was found in hepatopancreas in May and minimum in gills  $24.32 \pm 0.0055$  in December. Seasonal changes in Lipid content from *Lamellidens corrianus* was maximum in the foot and mantle during summer and minimum in monsoon and winter seasons. In *Lamellidens corrianus* maximum values of lipid was in foot  $14.4 \pm 0.8944$ , in mantel  $5.4 \pm 0.5477$ , in gill  $4.24 \pm 0.1673$  and  $7.87 \pm 0.1528$  in the hepatopancreas. The minimum value of lipid observed in foot  $1 \pm 0.8944$ , in mantel  $1.82 \pm 0.4472$ , in gill  $1.8 \pm 0.4472$  and in hepatopancreas  $0.70 \pm 0.0040$ .

## CONCLUSIONS

Seasonal changes in the biochemical composition showed changes in total protein, glycogen and lipid content from the foot, mantel, gill and hepatopancreas of *Lamellidens corrianus* were studied from January 2013 to December 2013. In *Lamellidens corrianus*, maximum protein content was found from hepatopancreas  $388 \pm 0.0444$  mg/gm in summer and minimum  $17 \pm 0.0109$  from foot in winter. Glycogen content was more during the summer season in all tissues. Maximum glycogen ( $306.28 \pm 0.4206$ ) was found from hepatopancreas in May and minimum in gills from  $24.32 \pm 0.0055$  in December. The lipid content was maximum from foot is  $14.4 \pm 0.8944$  whereas the minimum from mantel is  $5.4 \pm 0.5477$  in May.

## ACKNOWLEDGEMENTS

Authors are thankful to the Principal N. E. S. Science College Nanded for providing the Laboratory and Library facility.

## REFERENCES

1. **Baby, R. L., Hasan, I, Kabir, K.A., and Naser, M. N. 2010.** Nutrient Analysis of Some Commercially Important Molluscs of Bangladesh. *J.Sci. Res.* 2(2): 390-396.
2. **Beninger Peter G. and Albert Lucas 1984.** Seasonal variations in condition, reproductive activity, and gross biochemical composition of two species of adult clam reared in a common habitat: *Tapes decussates* J. Exp. Mar. Biol. Ecol., Vol.(79): 19-37.
3. **Bligh E.G. & Dyer W.J. 1959.** A rapid method of total lipid extraction and purification. *Canadian Journal of Biochemistry and Physiology*, 37(8): 911-917.
4. **Dan, H. and Ruobo, G. 2002.** Freshwater pearl culture and production in China. *Aquacul. Asia*. 7: 6.

5. **De-Zwaan, A. and Zandee, B. 1972.** Body distribution and seasonal changes in glycogen content of common sea mussel, *Mytilus edulis*. *Comp. Biochem. Physiol.*,43(A): 53-58.
6. **Dhakane Kamal R. 2014.** Study of changes in glycogen and protein contents in fresh water bivalve mollusk *Lamellidens marginalis* from Godavari River at Kaigaon near Aurangabad (Maharashtra) India. *IJPRD*, Vol. 6(10): 115 – 118.
7. **Dongre S. B., A. R. Kure 2013.** Change in lipid content, in the hepatopancreas of cerebralectomied freshwater bivalve mussel *Lamellidens corrianus*. *The Ecoscan Special issue*, Vol. IV: 75-78 an international quarterly journal of environmental sciences.
8. **Dongre S. B., A. R. Kure 2014.** Glycogen level in the different body part of cerebralectomized, bivalve mussel *Lamillidens Corrianus*. *Species*, 7 (17): 25-29.
9. **Dongre S. B. And D. L. Sonwane 2014.** Seasonal Changes In Lipid Content, In The Adductor Muscles Of Cerebralectomied Freshwater Bivalve Mussel *Lamellidens Corrianus*. *IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS)* Volume 9, Issue 1 Ver. II: 29-32.
10. **Ersoy, B. and Sereflisan, H. 2010.** The proximate composition and fatty acid profiles of edible parts of two freshwater mussels. *Turkish Journal of Fisheries and Aquatic Sciences*. 10: 71-74
11. **Haldar Ankhi, Tanmoy Kumar Dey, Pubali Dharland Jana Chakrabarti 2014.** Exploring the Nutritive Values of the Fresh Water Mussel *Lamellidens marginalis* as Potential Functional Food. *IOSR Journal of Environmental Science, Toxicology and Food Technology* Volume 8, Issue 8 Ver. III, 01-07.
12. **Janakiram, K. 2008.** Freshwater Pearl Culture Technology Development in India. *J. Applied Aquaculture*. 13(3-4): 341-349.
13. **Jadhav M. R., A. R. Gulave and A. N Vedpathak. 2012.** Changes in the lipid contents of freshwater bivalve, *Lamellidens marginalis* from Godavari river during different seasons (M.S) *Journal of Experimental Sciences*, 3(9): 27-29.
14. **Jadhav Mangesh and Arun Gulave 2012.** Seasonal Variation In The Protein Content Of *Lamellidens Marginalis* from Jayakwadi Dam, (M.S.) India. *Bioscience Discovery*, 3(3): 348-350.
15. **Khalua Ranajit Kumar, Satyajit Tripathy, Bhagyasree Paul and Debabrata Bairy 2014.** Seasonal Variation of Carbohydrate, Protein and Lipid of Common Freshwater Edible Gastropod (*Bellamya bengalensis*) of Medinipur District, West Bengal. *Research Journal of Biology*, 2: 49 – 52.
16. **Lowry O. H., Rosebrough N. J., Farr A. L. and R. J. Randall 1951.** Protein measurement with Folin phenol reagent. *J. Biol. Chem.* 193: 265-275.
17. **Mahajan P.R. 2014.** Alterations in lipid contents of fresh water bivalve, *Lamellidens marginalis* exposed to heavy metal salt (lead nitrate). *Cibtech Journal of Bio-Protocols* Vol. 3 (3): 21-23.
18. **Malathi, S. and Thippeswamy, S. 2013.** The proximate and mineral compositions of freshwater mussel *Parreysia corrugata* (Mullar, 1774) from Tunga River in the Western Ghats, India. *G.J.B.A.H.S.* 2(3): 165-170.
19. **Padewar S. K. 2016.** Seasonal metabolic variation of lipid content in freshwater bivalve *Lamellidens corrianus* (Lea, 1834). *Asian Journal of Science and Technology* Vol.07 (04): 2750-2752.
20. **Padewar S. K. and Mali R. P. 2016.** Variation of protein content in freshwater bivalve *Lamelliden corrianus* (lea, 1834). *Asian Journal of Science and Technology* Vol.07 (02): 2399-2401.
21. **Palpandi C., S. Vairamani and A. Shanmugam 2010.** Proximate composition and fatty acid profile of different tissues of the marine neogastropod *Cymbium melo* (Solander, 1786). *Indian J. Fish.*, 57(3): 35-39.

22. **Pandit S.V. 2005.** Seasonal variations in biochemical composition of fresh water Bivalves molluscs, *Lamellidens marginalis*. Thesis submitted to Ambedkar University, Aurangabad 223.
23. **Ravera, O., Cenci, R., Beone, G. M., Dantas, M. and Lodigiani, P. 2003.** Trace element concentrations in freshwater mussels and macrophytes as related to those in their environment. *Journal of Limnology*. 62(1): 61-70.
24. **Salman Jasim Mohammed and Ahmed Jouda Nasar 2013.** Total Lipids and Total Protein in two Mollusca Species as Environmental Biomarker of Pollution in Euphrates River, Iraq. *Int.J.Curr.Microbiol.App.Sci*. 2(10): 207-214.
25. **Santhiya. N, Ramasamy. M and Gayathri. M 2016.** Seasonal changes in the biochemical composition of freshwater bivalve *Parreysia corrugata* (Muller 1774) of lower anicut reservoir, Tamil Nadu. *International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2 (11)*: 85-99.
26. **Sicuro, B., Mioletti, S., Abete, C., Amedeo, S., Panini, E. and Forneris, G. 2010.** Potential utilisation of farmed freshwater mussels (*Anodonta anatine* and *Unio mancus*). *Cuban J. Agricultural Science*. 44: 4
27. **Shafakatullah Nannu, Sowmyashree Shetty, Reema Orison Lobo and Krishnamoorthy M. 2013.** Nutritional Analysis of Freshwater bivalves, *Lamellidens* spp. from River Tunga, Karnataka, India. *Research Journal of Recent Sciences* Vol. 2, 120-123.
28. **Shafakatullah N. and Krishnamoorthy M. 2014.** Nutritional Quality in Freshwater Mussels, *Parreysia* spp. of Periyar River, Kerala, India *Research Journal of Recent Sciences* Vol. 3, 267-270.
29. **Shaikh, M. J. 2011.** Seasonal variation in biochemical constituents in different body tissues of freshwater bivalve mollusk, *Lamellidens marginalis* (Lamarck) from Pravara river in Maharashtra. *Bioscan* 6(2):297-299.
30. **Singh Yambem Tenjing, Machina Krishnamoorthy and Seetharamaiah Thippeswamy 2012.** Seasonal changes in the biochemical composition of wedgeclam, *Donax scortum* from the Padukere beach, Karnataka. *Recent Research in Science and Technology*, 4(12): 12-17.
31. **Soumady D. and S. Asokan 2011.** A Study on Protein Content in Selected Organs of *Perna viridis* at Tranquebar Coastal Waters, Tamil Nadu, India. *World Journal of Zoology* 6 (4): 360-363.
32. **Shetty Sowmyashree, N C Tharavathy, Reema Orison Lobo and Nannu Shafakatullah 2013.** Seasonal changes in the biochemical composition of freshwater bivalves, *Parreysia* spp. From Tungabhadra river, Karnataka. *International Journal of Pharma Sciences and Research (IJPSR)* Vol 4 No 5.
33. **Chitra, K. C., & Abdu, S. U. N. N. I. Y. A. (2013).** Impact of Malathion on the biochemical composition of the freshwater fish, *Oreochromis mossambicus*. *Int J Zoo Res*, 3, 31-42.
34. **Mark Ford, Wendy M. Goedon, and Marijo Wimmer 1993.** Seasonal and annual variation in weight and biochemical content of the Zebra mussel, *Dreissena polymorpha*, in lake St. Clair. *J. Great Lakes Res.* 19(3): 541-552.
35. **Yambem Tenjing Singh, Machina Krishnamoorthy and Seetharamaiah Thippeswamy 2012.** Seasonal changes in the biochemical composition of wedgeclam, *Donax scortum* from the Padukere beach, Karnataka.
36. **Wagner, A. and Boman, G. 2004.** Biomonitoring of trace elements in Vietnamese freshwater mussels. *Spectrochimica Acta, Part B: Atomic Spectroscopy*. 59(8): 1125-1132.
37. **Li, D., Y. Zhang and A.J. Sinclair, 2007.** Seasonal variations of lipid content and composition in *Perna viridis*. *Lipids*, 42: 739-747.